SECTION 02575

PAVEMENT REPAIR AND RESURFACING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Site Clearing: Section 02110

B. Excavation, Backfilling, and Compacting for Utilities: Section 02222

C. Asphaltic Concrete Paving: Section 02510

1.2 QUALITY ASSURANCE

A. Qualifications of Asphalt Concrete Producer: Use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete.

1.3 PAVING QUALITY REQUIREMENTS

A. General: In addition to other specified conditions, comply with following minimum requirements:

1. Comply with requirements of Road Agency having jurisdiction.

2. Provide final surfaces of uniform texture, conforming to required grades and cross-sections.

3. Patches shall match existing grade and cross section unless otherwise directed by the Road Agency.

B. Surface Smoothness:

1. Test finished surface of each asphalt concrete course for smoothness, using a 10 foot straight edge applied parallel to and at right angles to centerline of paved areas.

2. Surfaces will not be acceptable if exceeding 0.25 inch in 10 feet unless more rigid requirements are established by the Road Agency.

1.4 SUBMITTALS

A. Certify that materials comply with Specification Requirements.

B. Certificate to be signed by asphalt concrete producer and Contractor.

1.5 JOB CONDITIONS

A. Weather Limitations:

1. Construct only when temperatures are above minimum specified in State Highway Standard Specifications unless waived by Road Agency having jurisdiction.

2. Do not construct pavement or base when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.

B. Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

C. Traffic Control:

1. Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.

2. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety and to cause the least interruption of work.

1.6 ROAD AND STREET RESTORATION REQUIREMENTS

A. The Contractor's responsibility as to road restoration shall include, but not be limited to, proper backfill and compaction of excavation, shaping and general restoration of the roadway, restoration of public and private improvements when damaged by construction, restoration of drainage facilities, scarification of existing surfacing, if required, removal of debris and surplus material and all other requirements of these Specifications. In addition, upon completion of the above restoration, backfill gravel and crushed gravel or crushed rock surfacing shall be placed where required, in the opinion of the Engineer.

B. Unless otherwise specifically authorized by the authority responsible for the roadway, the final grade and cross section shall conform to applicable Road Agency standard cross sections. In case of existing private roads they shall conform to the roadway that existed prior to construction. The removal and disposal of existing materials necessary to fulfill the above requirements shall be considered incidental to the construction and the costs thereof shall be included in the items for which payment is provided.

C. Manhole rings, valve boxes and monument cases shall be adjusted as necessary to be flush with the restored surface.

D. The Contractor shall comply with all requirements of all permits for installation of pipelines in authorized rights-of-way.

E. The Contractor will place and maintain sufficient and proper lights and barricades at all locations on roads not accepted by the Road Agency involved.

F. After completion of pipeline installation the Contractor shall clean up drainage ditches and restore all existing drainage structures that he may have damaged during the course of construction. He shall also comply with all drainage requirements of the agency involved upon which the agency's acceptance of the roads is conditioned.

G. The Contractor shall restore any private improvement on road rights-of-way including, but not limited to, culverts, driveways, curbs, sidewalks, parking strips, parking areas, or other permanent improvements, whether or not a permit for such improvements has been obtained.

H. On streets where the pipeline is located on the shoulder alongside existing bituminous or concrete surfacing, no payment shall be made for cost of restoring street surfacing which may be damaged by the Contractor's operations. If the Engineer requires crushed surfacing spread on the shoulder it shall be paid under the crushed surfacing bid item.

I. All streets in the construction area as well as any unpaved streets used by Contractor's trucks or any other equipment hauling material to and from the area, whether within the construction area or adjacent thereto, and any unpaved streets used as detours during the construction shall be serviced with an application of oil or continuous use of sprinkler trucks to allay the dust, and the cost thereof shall be included in the various items for the improvements. The oiling or sprinkling of the dust on roads or streets will continue until accepted by the Road Agency or the roads or streets have been graveled, dust oiled, or resurfaced. All streets, when required shall be sprinkled at least twice daily.

J. It is specifically understood and agreed that the Contractor is responsible for complying with all requirements of the Road Agency necessary to obtain written acceptance of the roads by the agency concerned, and for such work the Contractor will be paid only for the items included in this Contract.

K. Until accepted in writing by the Road Agency, the Contractor will maintain all roads in a condition satisfactory to the agency concerned. This shall include periodic grading of all streets on which traffic is allowed wherever in the opinion of the Engineer, such grading is required. A suitable motor grader shall be available for this work.

L. Any settlement which occurs during the first year after final contract acceptance shall be repaired by the Contractor at his expense.

2. PRODUCTS

2.1 CRUSHED SURFACING

A. Conform to Section 02510 and local agency requirements.

2.2 ASPHALT CONCRETE PAVEMENT

A. Asphalt-concrete pavement shall conform to the Technical Requirements of the City of San Bernardino Public Works Department.

2.3 ASPHALT TREATED BASE

A. Asphalt treated base shall conform to the Technical Requirements of the state highway department in which the project is located for asphalt treated base.

2.4 CONCRETE

A. All concrete shall be placed under the direct observation of the Engineer and shall comply with Section 03300. No concrete shall be placed without prior approval by the Owner and the Engineer.

3. EXECUTION

3.1 GENERAL PAVEMENT REPAIR REQUIREMENTS

A. Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.

B. The placing and compaction of the trench backfill, and the preparation and compaction of the subgrade shall be in accordance with the requirements of Section 02222 of these Specifications.

C. Prior to trench excavation in pavement surfaces, straight vertical trim lines shall be cut in order to minimize breakage and cracking of the remaining surfacing.

D. Before the patch is constructed all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces. The use of a concrete saw will not be required for asphalt pavement.

E. After completion of the patches, the entire roadway surface shall be cleaned by brooming, flushing, or such other methods as may be required. The early completion of this phase of the restoration is required, not only to facilitate public relations, control dust and traffic problems, but also to prevent the further break-up and cracking of the existing asphalt mat. If, in the opinion of the Engineer, the Contractor is not diligently pursuing the work in such a manner as to place the patch as soon as reasonably possible, the Contractor may be required to re-trim and remove any and all cracked areas in such a manner to produce a straight uniform edge.

F. Finished grade and cross section of patch shall match grade and cross-section of existing pavement.

G. All incidental work required to complete the patching of street surfaces as specified, including joints where required, shall be considered as incidental to the patching and the costs thereof shall be included in the items for which payment is provided.

3.2 ASPHALT CONCRETE TRENCH PATCH

A. Preparation:

1. As soon after compacting the trench backfill and placing and compacting backfill gravel, where required, the Contractor shall place and compact crushed surfacing in the trench area to a minimum depth of six (6) inches or depth to match the original cross section whichever is greater.

2. A tack coat of asphalt applied at the rate of 0.02 to 0.08 gallon per square yard of retained asphalt shall be applied through the use of mechanical equipment to all surfaces on which any course of asphalt concrete is to be placed or abutted. The spreading equipment shall be capable of uniformly distributing asphalt materials over any area in controlled amounts and shall be equipped with hand operated spray equipment for use only on inaccessible and irregularly shaped areas.

3. The tack coat shall be a heated cutback asphalt, or emulsified asphalt, mixing grade. The emulsified asphalt may be mixed with water at the rate of 1 to 2 parts water to 1 part of emulsified asphalt.

B. Two Lift Patch:

1. Immediately after completion of placing the base the Contractor shall place a one-inch minimum compacted thickness of asphalt concrete surfacing. The final surface of this lift shall be not lower than ½ inch below the existing surface.

2. If the existing pavement is more than two inches, the first lift of asphalt concrete shall be of the same depth as the existing pavement.

3. The Contractor may substitute an equal amount of asphalt treated base for crushed surfacing and first lift of asphalt concrete.

4. When ordered by the Owner or when required in the Special Provisions, the Contractor shall begin the placement of the second lift. A tack coat shall be placed over the patch area. Asphalt concrete modified so that maximum size aggregate is ½ inch shall be placed over the tack coat. Prior to rolling, the aggregate in the asphalt concrete shall be hand raked back from the edges and rolled in such a manner to produce a uniform "feather" edge over the existing surface. The minimum compacted thickness of the second lift over the trench area shall be one inch.

5. Where excess settlement of the first patch occurs, a leveling course shall be used to prevent the thickness of the second lift from exceeding two inches.

6. The edge of the patch shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately covered with sand and heated.

C. Single Lift Patch:

1. Immediately after completion of placing the base the Contractor shall place a two inch minimum thickness of asphalt concrete surfacing.

2. If the existing pavement is more than two inches the asphalt concrete shall be of the same depth as the existing pavement.

3. The edge shall be hand raked to produce a smooth edge where the patch abuts the existing pavement.

4. The thickness shall be adjusted so that a smooth uniform grade exists after rolling.

5. The edge of the patch shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately covered with sand and heated.

3.3 ASPHALT CONCRETE PAVEMENT

A. Full-width asphalt concrete pavement shall conform to the Technical Requirements of the standard specifications of the State Highway Department in which the project is located.

B. After the subgrade has been properly prepared and compacted, a minimum of two inches of asphalt concrete pavement Class B shall be placed and compacted.

C. If the existing pavement is more than two inches thick, asphalt concrete shall be of the same depth as existing pavement prior to construction.

D. The edges of the existing asphalt pavements and castings shall be painted with hot asphalt cement or asphalt emulsion immediately before placing the asphalt patching material.

E. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to established cross section and grade and to match adjacent paved surface.

F. The edge of the new pavement shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately covered with sand and heated.

3.4 ASPHALT CONCRETE OVERLAY

A. Before construction of an asphalt concrete pavement overlay on an existing surface, all fatty asphalt patches, grease drippings, and other objectionable matter shall be removed from the existing pavement. Excess asphalt joint filler shall be removed and premolded joint filler shall be removed to at least one-half inch below the surface of the existing pavement. Existing pavement or bituminous surfaces shall be thoroughly cleaned by sweeping to remove dust and other foreign matter.

B. Prior to placing asphalt concrete, a tack coat shall be applied using a heated cut back asphalt or emulsified asphalt at the rate of 0.02 to 0.05 gallons per square yard.

C. When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross section as required by the Road Agency involved. Preleveling of uneven or broken surfaces over which asphalt concrete is to be placed is required and may be accomplished by the use of asphalt concrete placed with a motor patrol grader, a paving machine, by hand raking, or by a combination of these methods. After placement, the asphalt concrete used for preleveling shall be compacted with rollers.

D. When asphalt concrete pavement is to be constructed over an existing paved or oiled surface, in addition to the preparation as outlined hereinbefore, all holes and small depressions shall be filled with an appropriate class of asphalt concrete mix. The surface of the patched area shall be leveled and compacted thoroughly. All previous patches that have settled shall be preleveled so that depth of overlay does not exceed two inches in thickness.

E. After preparation of the base a one inch minimum compacted full width layer of asphalt concrete shall be placed on top of an existing paving surface. Surfacing shall be placed in such a manner as to prevent disturbing existing drainage. Surfacing shall be feathered out as required to meet existing driveways, catch basins, traffic control pads, street intersections, etc., and shall include thickened edge paving where it is now existing.

F. The edges of the overlay shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately covered with dry sand and heated.

3.5 BITUMINOUS SURFACE TREATMENT REPLACEMENT

A. Unless otherwise specified, all light bituminous surface treatment shall be replaced with a one inch asphalt concrete overlay over a crushed surfacing base.

B. Base shall consist of four inches of crushed surfacing.

3.6 CRUSHED SURFACING

A. Existing crushed surfacing shall be replaced with new material.

B. Thickness of course shall be as directed by the Owner.

C. When the utility line is along the shoulder of a roadway, the Contractor may be directed to place a course of crushed surfacing along shoulder of the roadway. Thickness shall be as required by the Road Agency.

D. During dry periods, the Engineer may require water sprinkling prior to and during the placement of crushed surfacing. The cost of such sprinkling shall be included in the unit bid for crushed surfacing.

3.7 TEMPORARY TRENCH PATCH

A. The Contractor may be required to furnish and install a temporary trench patch only when specifically directed by the Owner or as provided on the Plans.

B. Area to be patched shall be cleaned out and graded to the bottom of the base course. Any loose asphalt shall be removed.

C. Place a patch consisting of 2-inch minimum course of crushed surfacing base and a 2-inch minimum course of cold asphalt plant mix placed over the trench area.

D. Both the base and surface course shall be placed and compacted so that the finished surface will match the grade and cross-section of the existing pavement.

E. Surface of pavement shall be cleaned of all dirt and debris before opening to traffic.

F. The Contractor shall maintain temporary patch until the permanent patch is installed.

3.8 CEMENT CONCRETE CURBS AND GUTTERS

A. Constructed with air entrained concrete.

B. Side forms shall rest throughout their length on firm ground and shall be full depth of the curb. They shall be either metal of suitable gauge for the work or surfaced "construction" grade lumber not less than two inches (commercial) in thickness. Forms shall be cleaned and well oiled prior to use. Forms used more than one time shall be cleaned thoroughly and any forms which have become worn, splintered, or warped shall not be used again. Forms shall be adequately supported to prevent deflection or movement.

C. The foundation shall be watered thoroughly before the concrete is placed.

D. Concrete shall be well tamped and spaded or vibrated in the forms.

E. Exposed surfaces shall be finished full width with a trowel and edger. Remove forms of all roadway face of curbs within 24 hours or placement of concrete and treat with a float finish. The top and face of the curb shall receive a light brush finish and the top of the gutter shall receive a broom finish.

F. Joints shall be spaced to match joints in the abutting pavement. If the abutting pavement is not jointed or the curb or gutter is not abutting pavement, joints in the curb and gutter shall be spaced at 15 foot intervals. These joints shall be 1/8 inch minimum thickness and constructed to a minimum depth of 1 inch by sawing or scoring with a tool which leaves the corners rounded and destroys aggregate interlock to a depth specified. Expansion joints, filled to full cross section with filler 1/4 inch thick shall be placed in the curb and gutter to match joints in the abutting pavement, at structures, curb returns and where shown in the plans.

G. Cure for 72 hours by one of the methods specified in Section 03300.

H. Curb and gutter may be constructed by the use of slip-form equipment provided the completed curb or gutter retains its shape, grade, and line. finishing, joints, and curing shall be as provided above.

I. Top of the form shall not depart from grade more than 1/8 inch when checked with a 10 foot straight edge. Alignment shall not vary more than 1/4 inch in 10 feet.

3.9 ASPHALT CONCRETE CURBS AND GUTTERS

A. Placed, shaped and compacted true to line and grade with machine capable of shaping and compacting the materials to the required cross section.

B. Provide tack coat of asphalt applied to the surface upon which asphalt concrete curb is to be placed immediately prior to placing of curb.

3.10 CEMENT CONCRETE SIDEWALKS

A. The concrete in the sidewalks shall be air entrained concrete in accordance with the requirements of Section 03300.

B. Forms shall be of wood or metal and shall extend for the full depth of the concrete. All forms shall be straight, free from warp and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

C. The foundation shall be brought to the grade required and well wetted before placing the concrete.

D. Place concrete in the forms and strike off with a heavy iron-shod straight edge, trowel surface smooth with a steel trowel as soon as surface can be worked. After troweling and before jointing or edging, the surface of the walk shall be lightly brushed in a transverse direction with a soft brush. On grades of over 4%, the surface shall be finished with a stipple brush.

E. Joints shall be constructed at the locations and of the sizes as indicated in the plan.

F. Cured for at least 72 hours by means of moist burlap or quilted blankets. Exclude all traffic, both pedestrian and vehicular, during curing period.

3.11 PAVEMENT MARKINGS

A. The Contractor shall restore any and all pavement striping and traffic buttons damaged during construction under this Contract.

B. Restoration shall be in accordance with the current standards of the Road Agency involved.

C. Cost of restoration of pavement striping and traffic buttons shall be incidental to pavement restoration.

3.12 DUST OIL

A. Dust oil shall be PS-300 Fuel Oil or equivalent.

B. Dust oil shall be applied by means of a bituminous distributor, so that uniform distribution is obtained over all points of the surface to be treated.

C. The entire width of the roadway shall be treated.

D. Dust oiling will not be permitted at temperatures below 50°F.

E. Oiling shall not be started unless trenches have been compacted, streets cleaned and reshaped and base course of crushed rock or gravel applied.

F. The allaying of dust prior to and subsequent to this application of dust oil shall be solely the Contractor's obligation in accordance with other provisions of these Specifications.

3.13 ADJUSTING MANHOLES TO GRADE

A. The Contractor shall adjust manhole castings to final grade by adding brick and/or mortar under the casting and patching with asphalt concrete. Paving adjusting rings will not be allowed.

B. The Contractor shall exercise extreme care in preventing foreign material from entering the manhole.

C. All manholes shall be adjusted to grade after the asphalt concrete surfacing has been placed. Disturbed area around cover shall be patched and sealed to the satisfaction of the Road Agency having jurisdiction.

D. The Contractor shall take care not to extend the manholes above finished grade.

3.14 ADJUSTING MONUMENT CASES AND VALVES BOXES TO GRADE

A. Monument cases and/or valve boxes shall be adjusted to final grade and patched with asphalt concrete.

B. Adjustment shall be made after the resurfacing.

C. Patching around monument cases and/or valve boxes shall be done to the satisfaction of the Road Agency having jurisdiction.

D. Valve boxes shall be adjusted to the satisfaction of the utility having jurisdiction.

E. The Contractor shall take care not to extend the monument cases and/or valve boxes above the finished grade.

* * * END OF SECTION * * *

SECTION 02576

ASPHALT/CONCRETE PAVEMENT REMOVAL

1. GENERAL:

1.1 Scope of Work

A. Furnish all labor, material, equipment and incidentals required to remove the entire section of pavement over the trenches used to install the water mains on the attached plans. The minimum trench width shall be 24 inches unless otherwise stated on plans. Actual trench width will vary with construction method and location.

B. Furnish all labor, material, and equipment necessary to remove and dispose of all excess spoil after the ground asphalt has been returned to the trench for use as a temporary driving surface until main construction is complete.

C. Furnish all labor, material, and equipment necessary to maintain all ground pavement surfaces free from potholes and large loose gravel areas.

D. Furnish all labor, material, and equipment necessary to remove any and all concrete underlayment beneath the pavement as encountered during the pavement removal process.

1.2 Reference Specifications

Except as otherwise specified herein, the current Standard Specifications for Construction, current edition, (a.k.a. "Green Book"), shall apply to materials and workmanship required for the work of this Section.

2. PRODUCTS:

2.1 Materials

A. Use locally available materials and aggregate gradations that exhibit a satisfactory record of previous installations. Any imported material necessary to fill potholes or soft spots in the ground trench shall comply with "Green Book" requirements for Class II base.

3. EXECUTION:

3.1 Layout and Alignment and Commitment

The SBMWD shall provide all construction staking as agreed to in a construction meeting to be held after award.

The Contractor shall review all markings with SBMWD in advance of the start of all grading operations. Any questions regarding trench width, trench location, and alignment shall be discussed and agreed upon prior to the start of the grinding operation.

The Contractor shall provide the SBMWD's Engineering Section with a written statement stating the following:

A. I, the Contractor, have reviewed the field markings with the SBMWD and have agreed on a scope of work.

B. The scope of work is within the bid perimeters which I agreed to when submitting my proposal.

C. I understand that it is my responsibility to maintain the driving surface of the roadway so that it is free from loose rocks, potholes, and dust during the entire construction process.

D. Signed and dated by an authorized agent of Contractor.

3.2 Asphalt Removal

The grinding shall be accomplished by one pass of the "**Bomag MPH 100**" asphalt reclaimed or approved equal. The grinding blade shall be set deep enough to cut through the entire existing pavement section so that no underground portion of asphalt remains within the proposed trench area.

All ground material shall be put back into the ground trench and compacted by wheel rolling and all excess material shall be removed an disposed of by the Contractor at no additional expense to the owner.

At the end of each business day and upon completion of the grinding, all ground areas of asphalt shall have the following characteristics:

A. The uncut pavement surface shall be clear of all loose material.

B. The ground trench shall be approximately level with the surrounding area.

C. The ground material within the ground area shall be free of overly soft or loose material.

3.3 Concrete Removal and Pavement

It is the opinion of the Department that large sections of the road bed contain concrete underlayment. All concrete visible from the surface and an additional 30,000 square feet subgrade concrete is considered as part of base bid. All additional concrete will be paid on a square foot basis. The following process shall be followed whenever concrete underlayment is encountered:

A. When concrete underlayment is encountered during the grinding process, it shall be clearly marked so that the area of concrete removal can be clearly calculated.

B. The Contractor shall meet the SBMWD in the field and review the concrete prior to removal.

C. The Contractor shall submit an invoice to the SBMWD clearly identifying the concrete needing removal (from station to station in a specific street), the area of concrete, the unit price for removal submitted on the bid schedule, and the total price for each section of concrete.

D. The SBMWD will then review the invoice and provide the Contractor with written permission to proceed with concrete removal.

E. Payment for concrete removal will be issued upon verification of the completion of work.

F. The unit price provided the Department on the bid schedule shall include removal, disposal, and overhead profit. The unit price shall apply to all concrete regardless of condition or thickness.

G. Disposal of concrete shall be done in a safe and legal manner.

H. For the purpose of identifying the lowest qualified Bidder, it shall be assumed that 40% of the existing pavement surface contains concrete underlayment.

I. The SBMWD will multiply the unit price for concrete by _____ square feet and apply that to the overall bid price.

3.4 Maintenance

Upon completion of the grinding process, the Contractor shall maintain all ground pavement surfaces fee from potholes and large loose gravel areas.

* * * END OF SECTION * * *

SECTION 02610

PIPE AND FITTINGS

1. GENERAL

A. Material applies to Contractor supplies pipe and fittings only.

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Inspection Services: Section 01420

B. Excavating, Backfilling and Compacting for Utilities: Section 02222

C. Water Lines: Section 02660

1.2 QUALITY ASSURANCE

A. Testing by Manufacturer:

1. Manufacturer shall test all materials as required by these Specifications and the standards referenced.

2. Manufacturer shall submit to the Engineer two (2) copies of all test results which shall include a certification that materials to be delivered are represented by the samples tested and that such delivered materials meet or exceed the specification requirements.

3. No material shall be delivered until test results and certifications are in the hands of the Engineer.

4. Engineer shall have free access to all testing and records pertaining to material to be delivered to the job site.

5. The Engineer may elect to be present at any or all material testing operations.

B. Joint tests are intended for qualification of joint design and shall be considered to be a qualification test to establish the adequacy of the manufacturer's joint design. The manufacturer shall certify that tests have been performed within the last year with pipes equivalent in size and design and that they have passed the test enumerated in the specifications. Tests may be waived for pipes of different strength class if joint design is the same as the pipe tested.

2. PRODUCT

2.1 DUCTILE IRON PIPE

A. Conform to AWWA C151 (ANSI A21.51) and shall be thickness Class 50.

B. Joints for buried service shall be mechanical joint or push-on joint and shall conform to AWWA C111 (ANSI A21.11). Joints located above ground or in vaults shall be flanged joints conforming with AWWA C110.

C. Pipe and fittings shall have a cement mortar lining conforming to AWWA C104 (ANSI A21.4).

D. Restraint joints, when specified on the plans, shall be push-on type or mechanical type with a minimum working pressure of Class 50, U.S. Pipe "TR FLEX", EBAA IRON "MEGA-LUG" or approved equal.

2.2 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE (4 INCHES AND OVER)

A. Conform to AWWA C900.

B. Outside diameter equal to ductile iron pipe and with gasket bell ends.

C. Minimum wall thickness shall be equal to or greater than dimension ratio (DR) of 18 (150 psi) unless otherwise specified.

D. Joints shall conform to ASTM D3139 using a restrained rubber gasket conforming to ASTM F477.

E. All PVC water pipe shall be considered flexible conduit.

F. Restraint joints, when required, shall be EBAA IRON Series 1600 ductile iron restraint harness conforming to ASTM A536. The harness shall have a minimum working pressure rating of 150 psi.

2.3 DUCTILE IRON AND GRAY IRON FITTINGS

A. Use for ductile iron or PVC pipe.

B. Conform to AWWA C110 (ANSI A21.10) or AWWA C153 (ANSI 1921.53) as indicated.

C. Flanged joints shall conform to AWWA C.115 (ANSI A21.15).

D. Joint shall conform to AWWA C111 (ANSI A21.11).

E. Dimensions of fittings and design of bell may be modified to conform with the pipe being used.

F. Cement mortar lining conforming to AWWA C104 (ANSI A21.4).

G. Gaskets for flat faced or raised faced flanges shall be 1/8-inch thick neoprene having a durometer of 60 plus or minus 5.

H. Gaskets for flanges having a recess machined to receive an "O" ring shall be neoprene and shall have the dimensions and durometer as recommended for the particular service application by the flange manufacturer.

I. Provide type, material and identification mark for bolts and nuts.

J. Wall pipe shall be ductile iron or gray iron with a minimum pressure rating of 250 psi.

K. Restraint joints for ductile iron pipe shall be push-on type or mechanical type with a minimum working pressure of 350 psi, U.S. PIPE "TR FLEX", EBAA IRON "MEGA-LUG" or approved equal.

L. Restraint joints for PVC pipe shall be EBAA IRON Series 2000 PV MEGALUG Retainer Gland or approved equal.

2.4 FLEXIBLE COUPLINGS

A. Use for connection between plain end pipe of same or different material.

B. Sleeve: Gray iron ASTM A126 Class B or ductile iron ASTM A536. Ends have a smooth inside taper for uniform gasket seating.

C. Followers: Ductile iron ASTM A536.

D. Gaskets: Grade 30 specially compounded rubber of all new materials.

E. Bolts and nuts: High strength low alloy steel with heavy, semi-finished hexagon nuts to AWWA C111 (ANSI-A21.11).

3. EXECUTION

3.1 INSTALLATION

A. Install pipe in accordance with specification section for pipeline being installed.

* * * END OF SECTION * * *

SECTION 02640

VALVES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Inspection Services: Section 01420

B. Excavating, Backfilling and Compacting for Utilities: Section 02222

C. Pipe and Fittings: Section 02610

D. Water Lines: Section 02660

1.2 QUALITY ASSURANCE

A. Testing by Manufacturer:

1. Manufacturer shall test all materials as required by these Specifications and the standards referenced.

2. Manufacturer shall submit to the Engineer two (2) copies of all test results which shall include a certification that materials to be delivered are represented by the samples tested and that such delivered materials meet or exceed the specification requirements.

3. No materials shall be delivered until test results and certifications are in the hands of the Engineer.

4. Engineer shall have free access to all testing and records pertaining to materials to be delivered to the job site.

5. The Engineer may elect to be present at any or all materials testing operations.

2. PRODUCTS

2.1 GATE VALVES

A. Gate valves shall be resilent-seated gate valves conforming to AWWA C509.

B. Gate valves shall have non-rising stems, opening by turning counter-clockwise. Valves shall be provided with o-ring shaft seals and operating nuts in accordance with the applicable sections of AWWA C509.

C. Epoxy lined per AWWA C550.

2.2 BUTTERFLY VALVES

A. Conform to AWWA C504, Class 150B.

B. Suitable for direct burial.

C. Mechanical joint or push on joint suitable for installation with type and class of pipe being used or flanged where detailed.

D. Standard O-ring shaft seal. Tight-closing with rubber seats securely bonded to valve body.

E. Operator shall be traveling nut or worm gear type, sealed, gasketed and permanently lubricated for underground service.

F. Operator shall be designed to withstand all anticipated operating torques and designed to resist submergence in ground water.

G. Equipped with a standard two-inch operating nut.

H. Open counter clockwise.

I. Epoxy lined per AWWA C550.

2.3 STEM EXTENSION

A. Provide stem extension with standard operating nut and self-centering rockplate support for all valves with operating nut more than 4 feet below grade to raise operating nut to within 36 inches of the ground surface.

2.4 VALVE BOXES

A. Provide for all buried valves.

B. Valve boxes and tops shall be cast iron 2 piece slip joint type.

C. Lengths suitable for the particular project or as specified.

D. Base corresponding to size of valve.
E. Cover shall have the word "Water" cast on it.

2.5 COMBINATION AIR RELEASE VALVE

A. Designed to operate with potable water under pressure to allow entrapped air to escape from the pipeline.

B. Body and cover: Cast iron conforming to ASTM A48, Class 30.

C. Floats: Stainless steel conforming to ASTM A240 and designed to withstand 1,000 psi pressure.

D. Seats: Buna N rubber.

E. Internal Parts: Stainless steel or bronze.

F. Designed to withstand 300 psi pressure with normal operating pressure under 100 psi.

G. Manufactured by APCO or equivalent.

H. Vault shall be precast concrete meter box or utility vault as indicated on the detail.

3. EXECUTION

3.1 GATE VALVE OR BUTTERFLY VALVE INSTALLATION

A. Valves shall be accurately set at places designated on the drawings.

B. Inspect each valve for defects.

C. Adjust stuffing boxes to ensure watertightness without binding the stem.

D. Set valve and valve box plumb.

E. Set lower casting of valve box so that it is supported by a styrofoam collar not less than 2 inches in thickness.

F. Tamp backfill around valve box to a minimum distance of 3 feet on all sides or to face of trench.

G. Set valve box cover flush with surface.

3.2 BLOCKING

A. Provide blocking for valve not connected to fitting with bolted connection.

3.3 TESTING

A. Test valves along with pipeline in which they are installed.

* * * END OF SECTION * * *

SECTION 02660

WATER LINES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Field Engineering: Section 01050

B. Inspection Services: Section 01420

C. Subsurface Investigations: Section 02010

D. Excavating, Backfilling and Compacting for Utilities: Section 02222

E. Pipe and Fittings: Section 02610

F. Valves: Section 02640

G. Existing Utilities/Facilities-Underground and Overhead: Section 02760

1.2 QUALITY ASSURANCE

A. Final Acceptance:

1. Prior to final inspection all pipelines shall be flushed and cleaned of all debris, disinfected and hydrostatically tested.

2. Any corrections required shall be made at the expense of the Contractor and the line retested.

2. PRODUCTS - NOT USED

3. EXECUTION

3.1 BEDDING FOR RIGID PIPE

A. Bedding for rigid pipe except ductile iron shall be as specified in Section 02222.

B. Unless otherwise ordered, bedding for ductile iron may be native bedding material, free of stones.

C. Bedding shall be carefully placed under the pipe and to a depth of at least six (6) inches over the top of the pipe.

D. Shall be thoroughly rammed and tamped around the pipe with the proper tools, so as to provide firm and uniform support over the full length of all pipe, valves and fittings.

E. Care shall be taken to prevent any damage to the pipe or its protective coating.

3.2 BEDDING FOR FLEXIBLE PIPE

A. Material to be used for bedding for flexible pipe shall be sand/gravel material as specified in Section 02222.

B. Bedding shall be placed in more than one lift. The first lift is to provide at least 4-inch thickness under any portion of the pipe and shall be placed before the pipe is installed, and shall be spread smoothly so that the pipe is uniformly supported along the barrel.

C. Subsequent lifts of not more than 6-inch thickness shall be installed to 6 inches over the crown of the pipe and individually compacted to 90 percent of maximum density.

3.3 PIPE LAYING

A. Pipe laying shall be done in accordance with the Specifications and instructions of the manufacturer of the kind of pipe used.

B. Tools designed especially for installing each particular type and kind of pipe shall be used.

C. Short Lengths and Field Cut Joints:

1. Short lengths of pipe supplied by the manufacturer shall be used to provide the proper spacing of valves, tees or special fittings.

2. Whenever it becomes necessary to cut a length of pipe, the cut shall be made by abrasive saw or by a special pipe cutter.

3. Pipe ends shall be square with the longitudinal axis of the pipe and shall be reamed and otherwise smoothed so that good connections can be made.

4. Threads shall be cleanly cut.

5. Flaring of copper tubing shall be accurately and smoothly done.

6. All operations for any connection shall be carefully done in accordance with the manufacturer's instructions.

D. Laying of Pipe on Curves:

1. Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints or by the use of shorter lengths of pipe.

2. When pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment.

3. Where field conditions require deflection or curves not anticipated by the Plans, the Contractor shall use deflected joints, short lengths or special fittings as required. No additional payment will be made for laying pipe on curves as shown on the Plans or for field changes involving pipe deflected at the joints. When special fittings not shown on the Plans are required to meet field conditions, additional payment will be made for fittings.

4. Maximum deflections at pipe joints and laying radius for various pipe lengths shall be as recommended by the pipe manufacturer.

E. Contamination Prevention:

1. Pipe, fittings and valves shall be carefully cleaned of all dirt and foreign material as they are placed.

2. Open ends of pipe and fittings shall be plugged with a temporary watertight plug whenever work is stopped and/or when water in the trench threatens to enter the pipe.

3. Groundwater shall be excluded from the pipe at all times.

4. Particular care shall be exercised to guard against the entrance of sewage into the water line trench during the course of construction. All sewer lines, house side sewers or other subsurface drains should be located prior to excavation. Adequate provision shall be made for the flow of sewers, drains, and other water courses during construction.

F. Condition of Pipe and Fittings:

1. The interior of all pipe, fittings and other accessories stockpiled on the project shall be kept free of dirt and other foreign matter at all times.

2. Each pipe, fitting or other accessory shall be carefully inspected and thoroughly cleaned of any dirt or foreign matter that might be present on the inside.

3. Cleaning shall be accomplished prior to lowering the pipe or other accessories into the trench.

4. Care shall be taken to keep materials internally clean after the pipe is placed in the trench.

3.4 BLOCKING AND BRACING

A. Blocking and bracing of the pipe and fittings shall be placed so as to secure bearing on undisturbed earth.

B. Blocking and bracing size shall be determined by the Contractor and shall be of sufficient proportions and installed so as to withstand the required test pressure and operating conditions.

C. Concrete shall be placed in back of all fittings with unbalanced thrust. Pre-cast blocking shall not be used.

D. Blocking shall not be covered up without its having been seen by the Engineer.

E. Blocking shall be formed so that bolts, joints, gaskets, and flanges of adjacent joints are clear of the concrete and so that bolts and joints can be dismantled without removing the concrete.

F. At tees and crosses where future mains connect, a pre-cast concrete brick may be used between fittings and thrust block.

G. Unless otherwise called for in the Bid Form, the cost of furnishing and installing all blocking shall be included in the price bid per lineal foot of pipe or lump sum bid if unit prices are not required.

3.5 CONNECTION TO EXISTING WATER MAINS

A. Type of connections shall be as shown on the Drawings.

B. Interior of pipe and fittings used in making connections shall be swabbed or sprayed with a 1% solution of hypochlorite before they are installed.

3.6 HYDROSTATIC PRESSURE TEST

A. All onsite and offsite piping shall be pressure tested using a District approved pressure gauge. Testing pressure shall be 225 pounds per square inch (psi) continuously for a period of 2 hours for all piping except for the Canal Zone pipeline and the State Water Project pipeline. The Canal Zone and State Water Project pipelines shall be tested at 350 psi.

B. The leakage shall be measured by determining the quantity of water required to maintain the test pressure. Regardless of the rate of leakage, all visible leaks shall be stopped.

C. Unless another method is approved, measurement of leakage shall be by positive displacement measurement of water pumped out of an open container after the pipeline test pressure has been obtained and stabilized, or through the use of the District supplied meter. The container shall be of a size and shape to allow simple and accurate determination of capacity and change in volume.

D. No pipe installation will be accepted by the District until or unless the leakage for the section of line tested is less than the rate of leakage specified herein.

E. The leakage rate for pipe shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours under the testing pressures indicated in 3.6A above.

F. The Owner's representative shall be present at all leakage tests. Prior to calling out the Owner's representative to witness the tests, the Contractor shall have all equipment set up completely ready for operation.

G. The Contractor shall provide adequate temporary air release valves during the charging of the lines after connections are completed and water is turned on.

3.7 DISINFECTION OF MAINS

A. Main sterilization shall be accomplished by either of the following two methods at the Contractor's option. Method No. 1 is, however, recommended as the most expedient manner in which good or satisfactory results may be obtained with a single application of disinfectant. No other method of sterilization will be accepted by the Engineer, unless, prior to use, the Contractor obtains written approval from the Engineer.

B. Method No. 1:

1. A chlorine gas-water mixture, or dry chlorine gas may be applied by means of a chlorinator, or the gas may be fed directly from a chlorine cylinder equipped with the proper devices for regulating the flow, and the effective diffusion of gas within the pipe. Use of the chlorinator is preferred to direct feed from the cylinder.

2. The preferable point of application for the chlorinating agent is at the beginning of the pipeline extension, or any valved section thereof, and through a corporation cock inserted in the horizontal axis of the pipe. The water injector for delivering the gas-water mixture into the pipe may be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension. In a new system, application may be at the pumping station, elevated tank, stand pipe, or reservoir.

3. Water from the existing distribution system, or other source of supply, shall be controlled to flow very slowly into the newly laid pipeline during application of the chlorine. The rate of chlorine gas-water mixture or dry gas feed shall be in such proportion that the rate of water entering the newly laid pipe will be between 50 and 80 parts per million. A color comparator set will be used to determine chlorine residual.

4. Back pressure, causing a reversal of flow in the pipe being treated, shall be prevented.

5. Treated water shall be retained in the pipe at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least twenty-five (25) parts per million.

6. In the process of chlorinating newly laid water pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

7. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity, until the replacement water throughout its length, upon

test, shows the absence of chlorine or in the event chlorine is normally used in the source of supply, until the tests shall show a residual not in excess of that carried by the system.

8. Following flushing, the main shall be allowed to set an additional 24 hours and then bacteriological tests shall be pulled by Owner's staff.

Should the initial treatment prove ineffective, the chlorination procedures shall be repeated until tests show that the water sample from the newly laid pipe conforms to the requirements of this Specification.

3.8 FLUSHING THE MAINS

A. Upon completion of pipe laying, chlorination and pressure testing, all dirt and foreign matter shall be removed by a thorough flushing through all hydrants, blowoffs or other approved means. Each section of newly laid pipe between valves or dead ends shall be flushed independently, and fire hydrants or other dead end appurtenances shall be flushed simultaneously with the parent line.

B. The Contractor shall be responsible for rescheduling and organizing his work so as to use flushing water only during off-peak hours and in the most economical manner.

C. No flushing shall be performed without the prior approval of the Owner.

D. Flush the line with a quantity of water equal to 3 times the line capacity.

E. Flushing flow rate shall be sufficient to maintain a minimum pipe line velocity of 3 feet per second through the duration of the flushing process.

F. Minimum diameter of flush line shall be 4 inches on 8-inch and larger mains.

3.9 PLACING IN OPERATION

A. Upon completion of the work and before its final acceptance, the entire system shall be put in operation under normal pressure and operated at that pressure for a period of not less than ten (10) days by the Contractor.

B. Any leaks or defects in the construction of the system that may develop, shall be repaired and the test continued until the system is practically watertight.

C. No provision of this Section shall be construed as waiving any provision of the Contractor's guarantee.

* * * END OF SECTION * * *

SECTION 02760

EXISTING UTILITIES/FACILITIES UNDERGROUND AND OVERHEAD

4. GENERAL

4.1 RELATED WORK SPECIFIED ELSEWHERE

A. Inspection Services: Section 01420

B. Excavating, Backfilling and Compacting for Utilities: Section 02222

4.2 LEGAL REQUIREMENTS-UNDERGROUND FACILITIES

A. The Contractor shall, before commencing excavation in any area, comply with the provisions of any applicable laws relating to or governing the identification, location, marking, and responsibility for protecting and repairing of underground facilities.

B. Whenever there may be a conflict between the provisions of any law and the provisions of these specifications, the provisions of law shall control.

C. Dial toll free 1-800-422-4133 at least two (2) days before you dig.

4.3 DEFINITIONS

A. Utility means any facility or item placed above or below ground for use in connection with the storage or conveyance of water, sewage, electronic, telephonic or telegraphic communication, cablevision, electric energy, petroleum products, gas, gaseous vapors, hazardous liquids, or other substances and including, but not limited to pipes, sewers, conduits, cables, valves, lines, wires, manholes, and attachments.

B. Utility conflict limit shall be defined as a zone bounded by the bottom of the trench to the existing ground level. Width of the zone at the trench bottom is the outside diameter of the utility plus 48 inches; extending to the top of trench, width of the zone increases 1 foot for each 3 feet of trench depth.

C. Pipe zone is defined as extending from the bottom of the required excavation to six (6) inches over the top of the pipe.

D. Inactive or abandoned utilities DO NOT MEET the definition of utility stated in items A through C above.

4.4 IDENTIFICATION

A. All underground utilities known by the Owner to be in the proposed area of excavation are identified on the project plan.

B. The underground utilities identified on the plans have not and cannot be precisely located by the Owner or its agents or engineers and location is approximate only because such information is within the control of the owners of the underground utilities. The Owner, under this Contract, does not warrant the location of underground utilities.

C. NOTICE: Overhead electrical service lines are generally not shown on the drawings. Electrical transmission lines shown on the drawings are located by point to point, power pole to power pole connections. The transmission cables or wires may be located on either side of the drawing location depending upon the configuration of the crossarms on the power poles or towers. Line voltage is not shown.

D. Other overhead utility lines are generally not shown on the drawings.

4.5 NOTIFICATION

A. It is the responsibility of the Contractor to give notice to the Owner or owners of any utilities known or suspected to be within the area of any proposed excavation or construction activities.

B. The Contractor is responsible to have the locations of underground utilities marked by the utility owners prior to beginning excavation.

C. The Contractor is responsible for determining the extent of any hazard created by electrical power in all areas and shall follow procedures during construction as required by law and regulation. Prior to construction, the Contractor shall meet with utility owners and determine the extent of hazards and remedial measures and shall take whatever precautions may be required.

D. The Contractor's attention is directed to federal, state, and local safety codes relative to limitations of work in proximity to overhead power lines.

4.6 QUALITY ASSURANCE

A. The Contractor will be required to have available a pipe finder and a man capable in its use and to utilize same to satisfy himself as to the exact location of such underground facilities in the interest of avoiding unnecessary damage, maintenance costs, and to insure continuity of customer service.

B. Contractors shall cooperate with utility owners to aid in locations and maintenance of existing utilities.

4.7 ELECTRICAL TRANSMISSION AND SERVICE LINES

A. Since neither the Engineer nor the Owner can anticipate the construction methods or techniques and equipment to be used by the Contractor in performing the work, the extent of the possibility of the Contractor's equipment and personnel coming in contact with electrical transmission lines cannot be fully anticipated, and there is no representation that all electrical transmission lines are shown on the plans.

B. The Contractor is charged with the responsibility of observing and investigating the presence of any electrical transmission lines which might impinge on his work whether overhead or underground and shall consult with and utilize the information given by utility owners and operators to determine the extent of any hazards and remedial measures required, and follow appropriate safety procedures.

4.8 ABOVE GROUND UTILITIES

A. Existing above ground utilities, whether shown on the drawings or not, shall be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor in a manner satisfactory to owners and operators of the utilities.

4.9 MAJOR UNDERGROUND UTILITIES

A. Existing major underground utilities and appurtenant structures within the "Utility Conflict Limits" or area of excavation shall be maintained, relocated, rerouted, removed and restored by the Contractor.

B. Existing major underground utilities and appurtenant structures outside of the "Utility Conflict Limits", whether shown on the drawings or not, shall be maintained and restored by the Contractor if damaged.

4.10 UTILITY SERVICE LATERALS

A. Minor underground utility service lines, including but not limited to sanitary sewer services, gas services, water services, house or yard drains, and electricity or telephone services and driveway culverts shall be maintained, relocated, rerouted, removed and restored by the Contractor with the least possible interference with such services.

B. Even though the presence of minor underground utility service lines may be deemed changed or differing conditions, in no case shall the interference of such service lines be the basis for extra compensation except in the case of a conflict, not shown on the plans, with sanitary sewer service occurring at an elevation between the top and bottom of the proposed pipeline or structure together with the pipe zone, the Contractor will be reimbursed for costs thereof.

4.11 RESTORATION BY UTILITY OWNER

A. The right is reserved by owners of public utilities and franchises to enter upon any street, road, right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or adjustments caused by the Contractor's operations.

B. The Contractor shall save the Owner harmless of any costs so incurred in restoration of a utility damaged by the Contractor except in special cases outlined above, and subject to the provisions of any law.

4.12 RESTORATION OF DRAINAGE FACILITIES

A. Where it is necessary for drainage facilities to be removed and replaced, existing pipe and catch basins may be reinstalled when approved by the agency having jurisdiction.

B. The materials shall be cleaned.

C. When it is necessary to replace existing pipe or catch basins, the new materials shall be of equal strength and similar design to existing materials.

D. Installation shall be in accordance with the applicable provisions of these specifications.

E. All costs, whether new or existing facilities are installed, shall be considered to be included in the unit prices bid for the various items and no additional payment shall be allowed.

* * * END OF SECTION * * *

SECTION 02980

LANDSCAPE RESTORATION

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Protection and Maintenance of Work and Property: Section 01545

B. Site Clearing: Section 02110

1.2 SUBMITTALS

A. Duplicate copies of a statement signed by the vendor certifying that each lot of seed has been tested by a recognized seed testing laboratory within 6 months before the date of delivery on the project.

B. Duplicate copies of certification from grower certifying the grass species and locations of field from which sod was cut.

1.3 JOB CONDITIONS

A. Areas landscaped and/or seeded prior to construction shall be restored to their original condition.

B. Unless otherwise specified, the Contractor shall have the option of reseeding or resodding lawn areas that are disturbed during construction.

C. All plants or shrubs within landscaped areas that are damaged during construction shall be replaced with plants equal to that existing prior to construction. Any covenants to stipulations in easements shall be adhered to.

D. All areas shown on the Plans to be planted, seeded or sodded shall be accomplished in accordance with this section.

2. PRODUCTS

2.1 TOPSOIL

A. Native topsoil to be reused shall be segregated and stockpiled separately from subsoils and other bulk materials, kept free of weed seeds, stones, refuse or other deleterious substances and covered until ready for placement.

B. Topsoil that is required to be furnished by the Contractor from a source other than the area upon which it will be placed shall consist of fertile, friable soil, preferably of a loamy character, typical of the topsoil common to the locality, and it shall contain a normal amount of organic matter.

C. It shall be obtained from arable land and shall be free from subsoil, refuse and other deleterious substances. It shall be reasonably free from brush, roots, heavy clay, sticks and other litter and shall contain no stones or gravel larger than 1/2-inch in diameter.

D. It shall be free of toxic amounts of either acid or alkaline elements and be capable of sustaining healthy plant life.

E. It shall be approved by the Engineer before placement.

2.2 SEED

A. Grasses and legumes for cover crop seed shall conform to the standards of State Department of Agriculture. Seed shall be furnished in standard containers on which shall be shown the following information:

1. Common name of seed.
2. Lot number.
3. Net weight.
4. Percentage of purity.
5. Percentage of germination (in case of legumes percentage of germination to include hard seed).
6. Percentage of weed seed content and inert material clearly marked for each kind of seed in accordance with applicable state and federal laws.

2.3 FERTILIZER

A. General:

1. Fertilizer shall be a standard commercial grade of organic or inorganic fertilizer of the kind and quality specified herein. It may be separate or in a mixture containing the percentage of total nitrogen, available phosphoric acid, and water-soluble potash in the amounts specified.

2. All fertilizers shall be furnished in standard unopened containers with weight, name of plant nutrients, and manufacturer's guaranteed statement of analysis clearly marked, all in accordance with state and federal laws.

3. Fertilizer shall be ground to a fineness as required for the method of application.

B. Lawn Fertilizer:

Total Nitrogen	7%
Available Phosphoric Acid	16%
Water Soluble Potash	18%

C. Cover Crop Fertilizer:

Total Nitrogen	12%

Available Phosphoric Acid 12%
Water Soluble Potash 12%

2.4 SOD

A. Imported Sod:

1. Sod shall be of first quality turf grass sod composed of acceptable grass mixtures, relatively weed free.

2. Sod shall be machine cut to a uniform soil thickness not less than 3/4 of an inch or more than one inch (1"). Individual sod pieces shall be cut to a standard width and to an acceptable length that provides for efficient and proper installation.

3. Sod shall be harvested, delivered and installed within a 48-hour period.

4. The Contractor, upon request, shall submit one standard piece of sod for the Engineer's approval.

B. Native Sod:

1. Native sod shall be replaced in the lawn of original removal.

2. The area of sod to be removed shall be laid out in squares or strips of such size as to provide easy handling and matching. The sod shall then be carefully cut along these lines taking care to keep all cuts straight and strips of the same width. After the sod has been cut vertically, it shall be removed to a uniform depth with an approved type of sod cutter. This operation shall be performed in such manner as to ensure uniform thickness of sod throughout the operation.

3. As the sod scalping proceeds, the sod strips shall be placed in neat piles at convenient locations and from then on they shall be maintained in a damp condition continuously until the sod strips are replaced on the lawn. In no case shall the sod remain in piles longer than ten (10) days before replacement on the lawn.

2.5 PLANT MATERIALS

A. Plants shall be healthy, in vigorous growing condition, and be guaranteed true to size, name and variety. Nomenclature shall be listed in Standardized Plant Names, Second Edition, 1942.

B. Size and quality shall be equal to existing plants or as shown on the Plans. Plants shall be No. 1, nursery grown, freshly dug, of normal growth and habit, free from diseases and insects.

3. EXECUTION

3.1 LAWN SEEDING

A. All areas to be put into lawn shall have a minimum depth of 6 inches of topsoil.

B. Immediately prior to placing topsoil, the surface area upon which it is to be placed shall be cleaned of objectionable matter and the area be smoothed and compacted.

C. The finish grade of all areas to be put into lawn shall be smooth, without visible impressions or mounds and shall be flush with the top of adjoining curbs, walks and drives.

D. After establishing the finish grade, all areas shall be hand raked, rolled and again hand raked, removing all rocks, weeds and debris.

E. Commercial fertilizer shall be applied at a rate of eight (8) pounds per thousand (1,000) square feet.

F. Lawn seed shall be seeded over all areas to be put into lawn at the rate of three (3) pounds per thousand (1,000) square feet.

G. After seeding, ground horticultural peat moss shall be spread 1/4-inch deep with an approved spreader over all seeded areas.

H. The exact time for seeding will be determined by actual weather conditions. The normal satisfactory periods for seeding shall be considered as being between March 1 and May 1 and between September 15 and October 20.

I. When delays in operations carry the work beyond the most favorable planting season or when weather conditions are such that satisfactory results are not likely to be obtained for any stage of the seeding operations, the Contractor will stop the work and it shall be resumed only when the desired results are likely to be obtained or when approved alternates or corrective measures and procedures are adopted.

J. Maintenance shall commence immediately on planting and the lawn area shall be kept damp for 10 days to 2 weeks. Protect all seeded areas by watering, mowing and replanting as necessary for at least thirty (30) days and as long as necessary to establish a uniform stand of grass, and a minimum of two (2) cuttings.

3.2 SOD

A. Prior to placing the strips of sod, the scalped area shall be carefully shaped to proper grade and be thoroughly compacted. Wherever the construction operations have resulted in the placement of unsuitable or poorer soils in the area to be resodded, the surface shall be left low and covered with topsoil.

B. The finished grade, after shaping and compacting the topsoil, shall be thoroughly dampened prior to and immediately before replacing the sod.

C. The sod shall be replaced to the required grade, taking care to butt each piece tightly against the adjacent one.

D. Upon completion, the sod shall be dampened and rolled with a lawn roller.

E. All sod shall be kept moist during the first week after sodding. Water shall be provided for each of the next three weeks to provide a minimum of 2 inches of moisture per week.

3.3 PLANTING PITS

A. Trees: Vertical sides, flat bottom, circular or square 6-inch minimum planting soil below ball and/or roots, diameter or side dimension 2 feet greater than root system or ball diameter.

B. Shrubs conform to A above, except diameter or side dimension 1 foot greater than ball diameter or root.

C. Bulbs, bedding plants and ground cover 12 inches below finished grade.

3.4 PLANTING TREES, SHRUBS, GROUND COVER, BULBS AND BEDDING PLANTS

A. Use planting soil beneath and around cavity between plant ball or roots and pit sides. Tamp base firmly, place plant or tree, tamp soil in layers, thoroughly water each layer, loosen and fold burlap away from top of ball into pit. Fill balance of cavity with planting soil. Soak and continuously maintain adequate moisture.

B. Use approved root transplanting compounds and herbicides for bulbs and plants to prevent disease and assure best plant growth.

C. Leave watering "saucers" around each plant.

D. Support trees immediately after planting by staking and/or guying to maintain trees in plumb position.

E. Apply peat mulch where shown or noted on the Drawings. Mulch depth 3 inches unless otherwise noted.

F. Fertilize all trees, shrubs, and ground covers at time of planting.

3.5 FINAL INSPECTION

A. The Contractor shall protect all seeded, sodded or planted areas from erosion until final inspection and acceptance has been made. Areas damaged by erosion shall be prepared by the Contractor at his own expense.

B. Final inspection for seeded areas will not be made until 30 days following completion of all seeding, sodding, planting and fertilizing as specified. Damage caused by the Contractor

to areas which have been seeded or sodded shall be repaired and/or replaced by the Contractor at his own expense.

3.6 GUARANTEE

A. Guarantee of planting and seeding shall continue through the warranty period as stated in the warranty form. Contractor shall replace all plants or sod dead or dying within the guarantee period, or reseed lawns and cover crop where required. Guarantee shall include both materials and labor. Replacements shall be the same as originally planted.

* * * END OF SECTION * * *